International Journal of Civil Engineering and Technology (IJCIET)
Volume 8, Issue 3, March 2017, pp. 82–89 Article ID: IJCIET_08_03_008
Available online at http://www.iaeme.com/IJCIET/issues.asp?JType=IJCIET&VType=8&IType=3
ISSN Print: 0976-6308 and ISSN Online: 0976-6316

COST OPTIMIZATION OF CONCRETE BY REPLACING FINE AGGREGATE WITH WALNUT SHELL POWDER

Mirza Shahab Husain
Student, M. Tech (Construction Technology and Management),
Department of Civil Engineering, Integral University, Lucknow-India

Anwar Ahmad
Associate Professor), Department of Civil Engineering,
Integral University, Lucknow-India

Samarul Huda
Student, M. Tech (Construction Technology and Management),
Department of Civil Engineering, Integral University, Lucknow-India

Mohd Asim
Student, M. Tech (Construction Technology and Management),
Department of Civil Engineering, Integral University, Lucknow-India

ABSTRACT

The cost of the development material is expanding step by step in creating nation which leads in the exploration of the option material in the structural designing development. Presently work is going on development material to diminish the cost of the development. Among the vast majority of material horticulture squander material assumes a crucial part. The agribusiness squander either tossed as a waste or blazed which discharges heaps of dangerous material with prompts to breathing issues and numerous destructive sicknesses. So in this examination paper walnut shell is being utilized as option material. Concrete with the typical total and walnut shell powdered with the 10-30% of supplanting with walnut shell powdered.

Key word: Concrete, Cost Optimization, Walnut Shell Powder

Cite this Article: Mirza Shahab Husain, Anwar Ahmad, Samarul Huda and Mohd Asim, Cost Optimization of Concrete by Replacing Fine Aggregate with Walnut Shell Powder. *International Journal of Civil Engineering and Technology*, 8(3), 2017, pp. 82–89.
http://www.iaeme.com/IJCIET/issues.asp?JType=IJCIET&VType=8&IType=3

1. INTRODUCTION

Concrete is a material like comparative in appearance and properties to some characteristic lime stone shake. It can be thought to be artificial composite; the significant constituent of it is normal total, for example, rock or pulverized shake, sand and fine particles of concrete powder and at last blended with the water. While the development material cost is expanding step by step; the reasons are appeal, shortage of crude material and additionally high cost of vitality walnut shell speaks to over 60% of household waste volume. Walnut shell is an inexhaustibly accessible agrarian waste from neighborhood ventures. In this way, in creating nations like India, these squanders can be utilized as potential material or substitution material in the development field.

2. MATERIALS AND METHODS

The materials utilized as a part of this venture were walnut shell slag, sand (fine total), rock (coarse total), concrete and water. The great amount of walnut shell is promptly gotten from the northern piece of India. The walnut shell cinder is thought to be puzzolana since it has concoction constituent of specific components found in great puzzolana and common Portland concrete (OPC). The walnut shell fiery remains utilized as a part of this work is very much grained into fine particles. The walnut shell acquired from Kashmir state, India as a noteworthy walnut creating range in Northern India was then completely cleaned and dried for substance pretreatment with a specific end goal to expel pollutions from the shell. The following stage is to warm the treated walnut shell in an electric mute heater at a temperature of 500 0Cto 600 0C for 4 hours keeping in mind the end goal to create the walnut shell fiery debris. The outcome is then tried to decide the molecule measure dissemination of the cinder as per Indian standard establishment, which would pass microns sifter. Keeping in mind the end goal to uncover its synthesis, the examination of the GSA and the blended solid outline are directed at the basic research center of the Department of Civil and Construction Technology and Management Engineering, Integral University at Lucknow. The blend proportion utilized is 1:2:4 at various ostensible supplanting of OPC with GSA and water bond proportion of 0.55 by weight. The substitution levels of 0% to 30% by weight of GSA in the mass proportioning was utilized to set up the crisp solid blend which are then set into the test block molds of 150mm x 150mm x 150mm. For every substitution level, twenty test 3D shapes were thrown. In get ready for the compressive quality test, the test 3D squares were brought out of the molds following 24 hours and after that put in a curing tank containing clean water to cure for 7, 14, 21 and 28 days separately.

3. TESTING AND ANALYSIS

Table 1 Testing of 4 cubes of concrete with control walnut shell size of cube (150x150x150), M20

Design mix	Cement (kg/m3)	Walnut shell (0%)	Fine aggregate (kg/m3)	Coarse aggregate (kg/m3)	Water (litres)
A0	9	0	15	24.6	4
B0	9	0	15	24.6	4
C0	9	0	15	24.6	4
D0	9	0	15	24.6	4

Table 2 Testing of 4 cubes of concrete with 10% walnut shell size of cube (150x150x150), M20

Design mix	Cement (kg/m3)	Walnut shell (10%)	Fine aggregate (kg/m3)	Coarse aggregate (kg/m3)	Water (litres)
A1	9	0.9	14.1	24.6	4
B1	9	0.9	14.1	24.6	4
C1	9	0.9	14.1	24.6	4
D1	9	0.9	14.1	24.6	4

Table 3 Testing of 4 cubes of concrete with 20% walnut shell size of cube (150x150x150) M20

Design Mix No.	Cement (kg/m3)	Walnut shell (20%)	Fine aggregate (kg/m3)	Coarse aggregate (kg/m3)	Water (litres)
A2	9	1.8	13.2	24.6	4
B2	9	1.8	13.2	24.6	4
C2	9	1.8	13.2	24.6	4
D2	9	1.8	13.2	24.6	4

Table 4 Testing of 4 cubes of concrete with 30% walnut shell size of cube (150x150x150) m20

Design mix	Cement (kg/m3)	Walnut shell (30%)	Fine aggregate (kg/m3)	Coarse aggregate (kg/m3)	Water (litres)
A2	9	2.7	12.3	24.6	4
B2	9	2.7	12.3	24.6	4
C2	9	2.7	12.3	24.6	4
D2	9	2.7	12.3	24.6	4

4. RESULTS AND DISCUSSIONS

Table 5 Compressive strength of concrete (M20) after 28 days of curing

Walnut (%)	Average strength (M pa)
0	27.43 31.63 30.20 28.45
10	25.63 30.90 29.90 26.66
20	22.07 30.45 26.86 25.03
30	23.30 25.80 24.20 21.60

Table 6 Compressive strength of concrete (M20) after 28 days of curing

Walnut (%)	Average strength (Mpa)
0	27.43 31.63 30.20 28.45
10	25.63 30.90 29.90 26.66
20	22.07 30.45 26.86 25.03
30	23.30 25.80 24.20 21.60

Providing and laying in position machine batched and machine mixed design mix M-30 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying but excluding the cost of centering, shuttering, finishing and reinforcement, including fly ash and steel fiber in variable proportions to accelerate, retard setting of concrete, improve strength and durability.

Descriptive statistics showing fly ash content (0%, 10%, 20% and 30%) in mix design is highlighted in table7, 8, 9 and 10 in order.

Table 7 0% fly ash content in mix design

0% fly ash				
Description	**Unit**	**Quantity (cum)**	**Rate/cum**	**Amount**
Coarse aggregate (size 20mm)	cum	0.74	1175.00	867.24
Carriage of stone aggregate below 40 mm nominal size	cum	0.74	106.49	78.60
Coarse sand (zone III)	cum	0.42	1200.00	505.53
Carriage of Coarse sand	cum	0.42	106.49	44.86
OPC cement	tonne	0.43	6300.00	2677.50
Carriage of cement	tonne	0.43	94.65	40.23
fly ash (garage f)	cum	0.00	8.00	0.00
Carriage of fly ash	cum	0.00	106.49	0.00
steel fibre (both side hooked)	kg	6.38	40.00	255.00
Concrete Mixer and machine charges	day	1.00	800.00	800.00
LABOUR				
Mason	day	0.17	417.00	70.89
Beldar	day	2.00	329.00	658.00
Bhisti	day	0.90	363.00	326.70
Vibrator (Needle type 40 mm)	day	0.07	350.00	24.50

0% fly ash				
Description	**Unit**	**Quantity (cum)**	**Rate/cum**	**Amount**
TOTAL				6349.05
Add miscellaneous & Water Charges @ 1%				63.49
Total Amount				6412.54
add 15% of contractor profit				961.88
SUB TOTAL				7374.42
COST FOR 1 CUM				7374.42

Table 8 10% fly ash content in mix design

10% fly ash				
Description	**Unit**	**Quantity (cum)**	**Rate/cum**	**Amount**
Coarse aggregate (size 20mm)	cum	0.74	1175.00	867.24
Carriage of stone aggregate below 40 mm nominal size	cum	0.74	106.49	78.60
Coarse sand (zone III)	cum	0.74	1200.00	885.69
Carriage of Coarse sand	cum	0.74	106.49	78.60
OPC cement	tonne	0.74	6300.00	4649.88
Carriage of cement	tonne	0.74	94.65	69.86
fly ash (garage f)	cum	0.74	8.00	5.90
Carriage of fly ash	cum	0.74	106.49	78.60
steel fibre (both side hooked)	kg	0.74	40.00	29.52
Concrete Mixer and machine charges	day	0.74	800.00	590.46
LABOUR				
Mason	day	0.74	417.00	307.78
Beldar	day	0.74	329.00	242.83
Bhisti	day	0.74	363.00	267.92
Vibrator (Needle type 40 mm)	day	0.74	350.00	258.33
TOTAL		0.74		8411.21
Add miscellaneous & Water Charges @ 1%		0.74		84.11
Total Amount		0.74		8495.33
add 15% of contractor profit		0.74		1274.30
SUB TOTAL		0.74		9769.62
COST FOR 1 CUM				9769.62

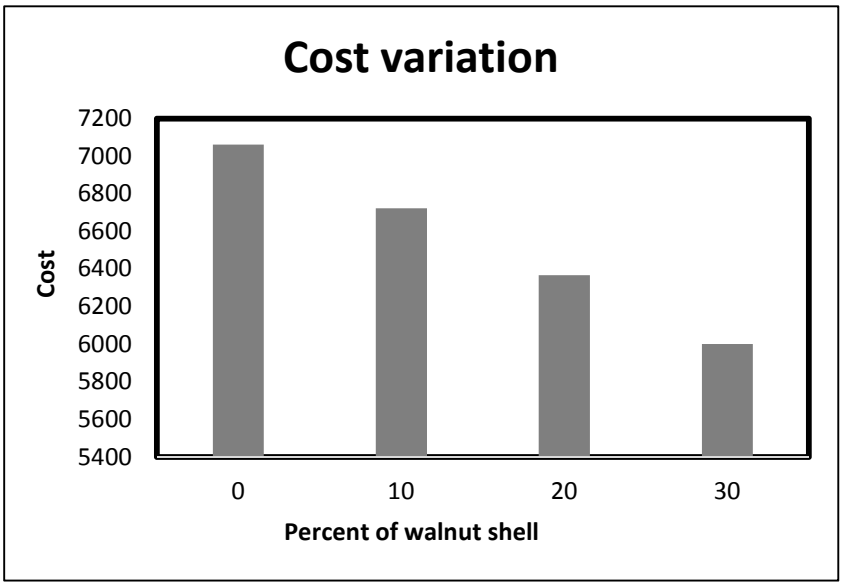
Table 9 20% fly ash content in mix design

20% fly ash				
Description	**unit**	**Quantity (cum)**	**Rate/cum**	**Amount**
Coarse aggregate (size 20mm)	cum	0.74	1175.00	867.24
Carriage of stone aggregate below 40 mm nominal size	cum	0.74	106.49	78.60
Coarse sand (zone III)	cum	0.42	1200.00	505.53
Carriage of coarse sand	cum	0.42	106.49	44.86
OPC cement	tonne	0.33	6300.00	2047.50
Carriage of cement	tonne	0.33	94.65	30.76
fly ash (garage f)	cum	0.08	8.00	0.60
Carriage of fly ash	cum	0.08	106.49	8.05
steel fibre (both side hooked)	kg	4.88	40.00	195.00
Concrete Mixer and machine charges	day	1.00	800.00	800.00
LABOUR				
Mason	day	0.17	417.00	70.89
Beldar	day	2.00	329.00	658.00
Bhisti	day	0.90	363.00	326.70
Vibrator (Needle type 40 mm)	day	0.07	350.00	24.50
TOTAL				5658.23
Add miscellaneous & Water Charges @ 1%				56.58
Total Amount				5714.82
add 15% of contractor profit				857.22
SUB TOTAL				6572.04
COST FOR 1 CUM				6572.04

Table 10 30% fly ash content in mix design

30% fly ash				
Description	**Unit**	**Quantity (cum)**	**Rate/cum**	**Amount**
Coarse aggregate (size 20mm)	cum	0.74	1175.00	867.24
Carriage of stone aggregate below 40 mm nominal size	cum	0.74	106.49	78.60
Coarse sand (zone III)	cum	0.42	1200.00	505.53
Carriage of coarse sand	cum	0.42	106.49	44.86
OPC cement	tonne	0.28	6300.00	1732.50
Carriage of cement	tonne	0.28	94.65	26.03
fly ash (garage f)	cum	0.10	8.00	0.77
Carriage of fly ash	cum	0.10	106.49	10.22
steel fibre (both side hooked)	kg	4.13	40.00	165.00
Concrete Mixer and machine charges	day	1.00	800.00	800.00
LABOUR				
Mason	day	0.17	417.00	70.89
Beldar	day	2.00	329.00	658.00

30% fly ash				
Description	**Unit**	**Quantity (cum)**	**Rate/cum**	**Amount**
Bhisti	day	0.90	363.00	326.70
Vibrator (Needle type 40 mm)	day	0.07	350.00	24.50
TOTAL				5310.83
Add miscellaneous & Water Charges @ 1%				53.11
Total Amount				5363.94
add 15% of contractor profit				804.59
SUB TOTAL				6168.53
COST FOR 1 CUM				6168.53



Cost	Percent of walnut shell
7374.42	0%
9769.62	10%
6572.04	20%
6168.53	30%

Figure 1 Cost escalation due to increase content of walnut shell in concrete

5. CONCLUSION

The experiment on compressive test on different walnut shell it has been found that by replacement of walnut shells in place of aggregates, 10%, 20% &30% replacement will have been decreased marginally the strength properties of concrete compared to the normal concrete. The optimum replacement of fine aggregate with walnut is obtained at 20%. It can very well serve as a light weight concrete in construction industry. By using these materials the reuse of agricultural waste material and reduce the cost of construction material in construction industry. The 28-day compressive strength of the concrete using walnut shell aggregate was found to be 29.3 N/mm2 under full water curing and it satisfies the requirement for structural lightweight concrete. It should, however, further investigations are required before it can be used as a building material.

REFERENCES

[1] Ferhat Ozdemir, Alperen Kaymakci, Nadir Ayrilmis Physical, mechanical, and thermal properties of polypropylene composites filled with walnut shell flour" by in "Journal of Industrial and Engineering Chemistry" year 2012.

[2] Amarnath Yerramala Ramachandrudu C, "Properties of Concrete with Coconut Shells as Aggregate Replacement", published in "International Journal of Engineering Inventions", year 2012.

[3] Daniel Yaw Osei,"Experimental assessment on coconut shells as aggregate in concrete", in "International Journal of Engineering Science Invention Volume 2 Issue 5 May. 2013

[4] Maninder Kaur, Manpreet Kaur, in "A Review on Utilization of Coconut Shell as Coarse Aggregates in Mass Concrete "International Journal of Applied Engineering Research, ISSN 0973-4562 Vol. 7 No.11,2012

[5] Abdullah AA. Basic strength properties of lightweight concrete using agricultural wastes as aggregates. In: Proceedings of international conference on low-cost housing for developing countries, Roorkee, India, 1984

[6] Mannan MA, Ganapathy C. Engineering propersties of concrete with oil palm shell as coarse aggregate. Constr Build Mater 2002; 16:29–34.

[7] Mannan MA, Ganapathy C. Concrete from an agricultural waste-oil palm shell (OPS). Build Environ 2004; 39:441–8.

[8] Mirza Shahab Husain, Anwar Ahmad, Samarul Huda and Mohd Asim, Cost Optimization of Concrete by Replacing Fine Aggregate with Walnut Shell Powder. International Journal of Civil Engineering and Technology, 5(11), 2014, pp. 181–191.

[9] Prof. Wakchaure M.R., Sapate S.V, Kuwar B.B. And Kulkarni P.S, Ccost Optimization of Reinforced Concrete Chimney. International Journal of Civil Engineering and Technology, 4(2), 2013, pp. 402–414.

[10] Alengaram UJ, Jumaat MZ, Mahmud H. Ductility behaviour of reinforced palm kernel shell concrete beams. Eur J Sci Res 2008; 23(3):406–20.